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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

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TITLE

FOREST INSECT SURVEY - SEASON OF 1943

YOSEMITE NATIONAL PARK, CALIFORNIA

by

John E. Patterson

Forest Insect Laboratory
341 Giannini Hall, U. C.
Berkeley 4, California
February 26, 1944

SUBJECT—

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U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
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YOSEMITE NATIONAL PARK, CALIFORNIA

Approved by:

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341 Giannini Hall, U. C.
Berkeley 4, California
February 26, 1944

ABSTRACT OF RESULTS

A. The 1942 Infestation (complete record)

1. Total timber (all species) killed on reporting areas (Table 3)

   a. Number of trees 4,305
   b. Volume 2,548,000 board feet
   c. Average number trees per section 10

2. Present classification - normal endemic

3. Primary insects: Western pine beetle in ponderosa pine.
   Mountain pine beetle in sugar pine and lodgepole pine.
   Jeffrey pine beetle in Jeffrey pine.
   Fir engraver beetle and western fir borer in fir.
   Hemlock barkborer in Douglas fir.

4. Trend - Slight increase over 1941

5. Control work completed - Maintenance control in Yosemite Valley

B. The 1943 Infestation (partial record)

1. Total timber (all species) killed on reporting areas (Table 3, est.)

   a. Number of trees 4 711
   b. Volume 3,023,000 board feet
   c. Average number trees per section 11

2. Present classification - normal endemic (epidemic in stands adjacent to Arch Rock burn)

3. Primary insects: Same as in 1942

4. Trend - Generally slight increase over 1942. Substantial increase in stands around burn.

5. Control work completed - Maintenance control in Yosemite Valley. Direct control in Big Meadows began in December.

6. Control work recommended - Direct control by peel-burn method on 30,000 acres adjacent to Arch Rock burn. Control area includes Big Meadows, Yosemite Valley and Grouse Creek units. This work to be completed by spring of 1944.

INTRODUCTION

A forest insect survey of the Yosemite National Park has been made annually for the past ten years by foresters of the National Park Service and by entomologists of the Berkeley, California, Forest Insect Laboratory of the Bureau of Entomology and Plant Quarantine. These surveys have not been a joint undertaking, but the data secured by both agencies have been used by the Bureau as a basis in reporting annual forest insect losses and trends. In general, these independent surveys have been conducted in different forested sections, or areas, of the park so there has been very little duplication in effort, but have resulted in a more complete coverage than would have been possible with only one agency participating. In the past the Bureau has used freely the data secured by the Park Service in reporting current conditions. This same procedure has been followed in the present report, since its value has been well demonstrated in previous reports.

The 1943 survey was carried out intermittently during July, August and September. Owing to limitations in personnel and travel this year, coverage of the park was not as complete and detailed as was desired. For this reason the loss estimates are more sketchy than normally obtainable. These estimates are based on plot surveys and roadside strip surveys located in the ponderosa-sugar-Jeffrey pine forests of the western sections of the park. Elsewhere, the loss data were obtained from road traverse, reconnaissance viewing and counts of attacked trees. The Bureau personnel who engaged on these surveys were G. R. Struble, Jack W. Bongberg and John E. Patterson. In addition, valuable data on conditions in Yosemite Valley and on the needleminer infestations of the High Sierra region were supplied by the park through Ranger-Forester Emil Ernst.

REPORTING AREAS

During the survey, and later when the field data were assembled, it was apparent that some changes in the previously established reporting system would be helpful, particularly with respect to reporting areas and control units. Consequently these have been revised to conform more closely to the general distribution of park forests and to adhere as far as practicable to areas naturally bounded by topographic features or definite barriers. Under this arrangement, the park is divided into three main areas constituting the three principal drainage systems - Tuolumne, Merced and South Fork. These areas are further subdivided into control units comprising smaller areas of definite timber types, or other characteristics, and are separated by site conditions or change in type. The reporting areas and control units are shown in Table 1 and are designated by letter and number on the map accompanying this report.

A summary of timbered acreage and stand composition for each control unit is shown in Table 1. No attempt has been made to show volume figures since data on stocking are not available at this time. Because of recreational demands, those areas most frequently in use by park visitors are considered of first importance in any program designed to protect the forests from abnormal insect losses. Such conditions exist to a marked degree in Chinquapin, Alder Creek, Wawona and Tuolumne units, and it is on these units that the greatest protection is needed. The Yosemite Valley is subjected to constant use, both as administrative site and as the principal recreational area of the park. Protection of the forest on the valley floor against insect losses requires constant vigilance in locating attacked trees and the prompt destruction of the insect broods by direct control measures. Several of the High Sierra areas are in this same category in demanding prompt attention to increased insect activity.

The principal recreational areas comprise approximately 120,000 acres, the greater part heavily stocked with mature timber. The park forests are generally stocked with great numbers of mature and over-mature trees; a large percentage of which are highly susceptible to insect attack. Consequently recurring infestations may be expected as with increasing age over-mature trees reach the point of becoming particularly susceptible to insect attack.

Table 1. Entomological reporting areas and control units.

Reporting Area	Control Unit No.	Name	Timb'd Acreage	Prin. tree spp.
A - Wawona	1	Moraine	15,300	PP-JP-WF-RF
	2	Wawona	12,360	PP-SP-WF
	3	Alder Creek	14,520	PP-SP-WF
	9	Chilnualna	12,500	JP-LP-WF-RF
			54,680	
B - Merced River	4	Chinquapin	11,300	PP-SP-WF-RF
	5	Big Meadows	21,200	PP-SP-WF
	6	Yosemite Valley	9,600	PP-DF
	7	Bridal Veil	11,500	LP-JP-WF-RF
	8	Illilouette	29,600	JP-LP-WF-RF
	10	El Capitan	25,500	JP-LP-WF-RF
	11	Isberg	49,500	LP-RF
	12	Tenaya	32,500	LP-RF
			190,700	
C - Tuolumne River	13	Carlon	26,880	PP-SP-WF-DF
	14	White Wolf	25,600	LP-RF
	15	Hetch-Hetchy	85,600	JP-LP-RF
	16	Tilden	55,000	LP-RF
	17	Matterhorn	70,000	LP-RF
	18	Tuolumne	65,000	LP-RF
			328,080	

RESULTS OF THE SURVEY

Character of Infestation.

With one exception insect conditions generally over the park remained in an endemic status in all stands in the transition type forests. The infestations in Jeffrey pine, lodgepole pine and in fir declined even further than last year's low level. No aggressive infestations were found in the ponderosa-sugar pine transition type forests, except in the vicinity of the Arch Rock burn where infestations during the year reached epidemic proportions. The nuclei of these infestations developed in and surrounding the burned area during the season of 1942. Later, during 1943, beetle broods dispersed from the burned area and established enlarged infestations in adjacent stands.

A resume of events which followed this burn will help to clarify the subsequent insect situation in the contiguous timber stands. The fire occurred in October, 1941. It started in the bottom of the Merced Canyon and burned up the west wall through brush and oak cover and reached the pine belt at an elevation of 5,000 feet where it crowned in spots. The fire was brought under control at the top of the canyon wall, but not until after it had burned through a strip of timber from one-quarter to one-half mile in width. Much of the timber on the edge of the pine belt was killed outright by the fire. Farther up toward the summit the fire was not so intense and a great deal of the timber here was only scorched, leaving the upper crowns of trees uninjured. Several small islands of trees were missed by the flames

Presumably some concentration of beetles occurred in the burn during the late fall of 1941, although no definite records were secured in support of this usual event. It is quite evident that the western pine beetle concentrated in the burn and immediate vicinity during the flight period early in 1942, as faded trees appeared in abundance during the summer of that year. These fades appeared largely in groups of fire-injured trees, although similar groups developed in uninjured stands bordering the burn on the Big Meadows side.

During 1943 highly epidemic conditions developed in uninjured stands bordering the western limits of the burned area and by fall, faded trees formed a continuous strip one-half mile wide which extended the full length of the burn. To the west and north the pine belt continues unbroken through Big Meadows and over the high ridge which divides this basin and Cascade Creek canyon. Several groups of faded trees, ranging from 5 to 15 trees each, appeared simultaneously in these stands north of the burn. Eastward, across the Merced Canyon, lies the large, unbroken belt of pine of Grouse Creek basin. These stands are situated opposite the burn and at about the same elevation. In distance these attacked groups ranged from 1 to 5 miles from the burn. Undoubtedly they resulted from attacks by beetles that had dispersed from the concentration in and around the burn.

Examination of the burn and its environs in the fall of 1943 showed that a total of approximately 1,800 trees on the 800 acre burned area were killed by bark beetles during 1943. During the same season the

estimated beetle loss on approximately 5,000 acres of adjacent timber stands amounted to a total of 1,025 trees.

The overwintering infestation (1934-44) in these stands is estimated to be 800 infested trees. While it is obvious that the burn is largely responsible for increased infestations in adjacent timber stands there is another factor which should not be ignored. This factor is the presence of a great amount of recently wind-thrown timber on the areas surrounding the burn, particularly in Grouse Creek basin. The first group of these windfalls occurred in February, 1942, and the second group in January, 1943; hence they were contemporaneous with events following the burn. To what extent this material has influenced current infestations is unknown. Presumably it has been a contributing factor in the stands where much of it occurred.

Infestations as a whole in pine stands of the transition type forests outside the areas influenced by the Arch Rock burn were only slightly greater than in 1942. Except in and around the burned area, attacks on pine this year were confined to individual trees at widely scattered intervals. Most of the trees selected for attack by beetles were mature or overmature, with moderately vigorous to decadent crowns.

Insects involved - Season of 1943.

The western pine beetle, Dendroctonus brevicomis Lec., and the mountain pine beetle, Dendroctonus monticolae Hopk., were the two principal insects involved in infestations of the transition forests; the former attacking only ponderosa pine, and the latter both ponderosa pine and sugar pine. The Jeffrey pine beetle, Dendroctonus jeffreyi Hopk., was mainly responsible for losses in Jeffrey pine, although the flathead Melanophila was also present in many faded trees examined. The same combination of insects in the different pine species occurred in fire injured trees on the burn, resulting in epidemic losses in stands surrounding the burn.

Bark beetle damage to lodgepole pine was the result of attacks made by the mountain pine beetle. These infestations have been largely quiescent for the past ten years, although minor losses occurred on a few small local areas.

Defoliation of lodgepole pine by the needleminer, Recurvaria milleri Busck, was conspicuous on the few areas where this insect is still active at Forsyth Pass and locally north of the Tuolumne Canyon. However, the needleminer has shown only slight tendency to spread from these old established centers.

White and red fir losses can be attributed solely to the combined attacks of the engraver beetle, Scolytus ventralis Lec., and the western fir borer, Tetropium abietis Fall. During the year there was a definite decline in these losses.

Losses in Douglas fir were greatly reduced from former status. The few recently dead trees that were examined had been attacked by the flathead borer, Melanophila drummondi Kirby.

Measured and estimated losses.

Annual loss estimates for the transition type pine forests are based primarily on surveys of roadside strips located in representative stands of the control units. A tabulation of the data secured on these sample strips is shown in Table 2. These data were supplemented by counts of faded trees occurring on the areas examined. Loss estimates for the High Sierra forests of lodgepole pine and fir were mainly based on reconnaissance and travel through the reporting areas. Loss estimate summaries for that part of the park covered by the 1943 survey are shown in Table 3.

Table 2. Recorded pine losses sustained on roadside strips in 1943.

Reporting area	Control unit	Sample strip	Acreage	Tree Spp.	No. Trees	Volume b.f.	Volume per Acre
A	Wawona	RD-1	168	PP	6	5,120	31 BF
				SP	1	660	4 BF
	Alder Cr.	RD-2	120	PP	7	10,820	90 BF
				SP	1	2,260	19 BF
		RD-3	176	PP	7	6,160	35 BF
				SP	1	3,120	18 BF
			464	PP-SP	23	28,540	62 BF
B	Chinquapin	RD-4	164	PP	12	13,240	81 BF
				SP	0		0
	Big Meadows	RD-5	244	PP	7	12,100	50 BF
				SP	1	3,900	16 BF
		RD-7	105	PP	0		0
				SP	2	5,300	50 BF
	El Capitan	RD-8	140	JP	2	6,010	43 BF
			653	PP-SP-JP	24	30,560	47 BF
C	Carlon	RD-6	108	PP	0		0
				SP	0		0
	White Wolf	RD-9	44	LP	23	2,760	63 BF
			152	PP-SP-LP	23	2,760	18 BF

Trend of infestations.

A summary of insect-caused losses sustained during the last two years on the several control units is shown in Table 3. The loss figures given in this table are the total estimated for the biennium. A comparison of annual losses for the two years shows the most recent trend in these infestations. Generally low endemic conditions have prevailed throughout the park forests for the past five years. This condition was not greatly changed during 1943, except in certain areas where local conditions have affected the recent downward trend prevailing throughout the entire Sierra region.

Table 3. Estimated insect-caused losses on reporting areas and control units for the years 1942 and 1943.

Rep't. Area		Control Unit	Timb'd. Acreage	Tree Spp.	Timber killed 1942 Trees	Mb.m.	Trees/ Sec.	Timber killed 1943 Trees	Mb.m.	Trees/ Sec.
A	1	Moraine	15,300	PP-JP Fir	No data			No data		
	2	Wawona	12,360	PP-SP	105	84	5	155	131	8
				Fir	120	85	6	90	55	5
	3	Alder Creek	14,520	PP-SP	90	95	4	250	290	11
				Fir	120	90	5	90	70	4
	9	Chilnaulna	12,500	JP	40	24	2	45	30	2
				Fir	60	25	3	55	25	3
B	4	Chinquapin	11,300	PP-SP	75	83	5	300	330	15
				Fir	90	68	5	75	56	5
	5	Big Meadows	21,200	PP-SP	140	145	4	640	576	20
				Fir	60	45	2	55	40	2
	6	Yosemite Valley	9,600	PP	35	30	2	75	75	5
				DF	10	3	1	6	2	½
	7	Bridal Veil	11,500	LP-JP	90	20	5	75	15	4
				Fir	120	40	7	100	35	6
	8	Illilouette	29,600	JP	160	90	4	140	85	3
				Fir	160	60	4	150	55	3
	10	El Capitan	25,500	JP	170	150	4	160	145	4
				Fir	120	90	3	90	75	2
	11	Isberg	49,500	LP Fir	No data			No data		
	12	Tenaya	32,500	LP Fir	No data			No data		
C	13	Carlon	26,880	PP-SP	90	70	2	140	115	3
				Fir	200	160	5	100	80	2
	14	White Wolf	25,600	LP	350	21	9	300	18	7
				Fir	400	200	10	360	180	9
	15	Hetch-Hetchy	85,600	JP-LP	630	350	5	560	300	4
				Fir	870	520	6	700	420	5
	16	Tilden	55,000	LP Fir	No data			No data		
	17	Matterhorn	70,000	LP Fir	No data			No data		
	18	Tuolumne	65,000	LP Fir	No data			No data		
		TOTALS	573,460		4,305	2,548	10	4,711	3,203	11
		TOTAL PINE			1,975	1,162	4	2,840	2,110	6
		TOTAL FIR			2,330	1,386	5	1,871	1,093	4

The formerly low status of infestations throughout the transition type pine forest was maintained outside the units affected by the Arch Rock burn. On these units infestations during the year resulted in a pronounced increase in losses; the increase ranging from 200 to 400 percent, being greater in the stands nearest the burn.

Infestations in Jeffrey pine and lodgepole pine have remained near the level of former years. There are no present indications of a change in this status.

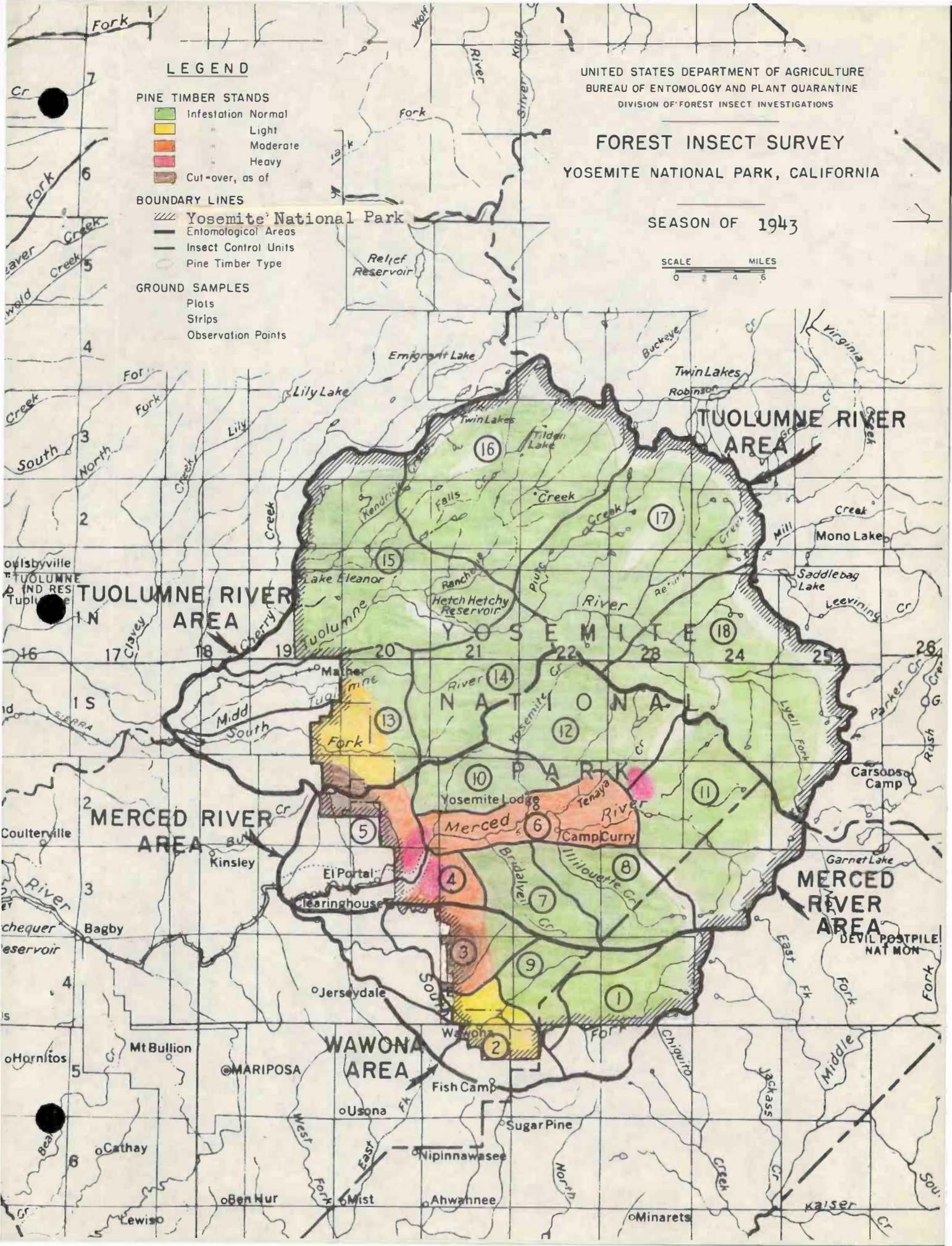
Infestations in fir declined during the year. Losses in all forests of this species have been consistently downward for the past several years and are now the lowest on record for the park stands. There are no indications of an early change in this trend.

RECOMMENDATIONS

Infestation conditions found generally this year do not appear sufficiently serious to call for any special control action of large scale. The present low endemic status of infestations in the Jeffrey pine-lodgepole pine stands and in fir is expected to continue for at least another year. Present management plans for these areas can well be limited to seasonal examinations to detect any change from the current status.

Maintenance control is recommended on areas of high recreational value, such as Yosemite Valley, the Wawona Road screen and in the Mariposa Grove. These areas were put on a maintenance-control basis several years ago and the results have clearly demonstrated the soundness of this plan.

Due to increased insect activity in and around the Arch Rock burn, losses had in late 1943 reached epidemic proportions. In order to reduce these losses and bring about an early return to normal status, the Park Service in early December inaugurated direct control measures on the burn and in adjoining timber stands. This work appeared timely and warranted by the values at stake. Consequently the Bureau gave the project full approval and offered assistance on the entomological phases. Plans for this project provide for complete coverage by direct control operations of timber stands within and adjacent to the burned area and also of all surrounding infestations influenced by the burn. Hence, the control area includes Big Meadows basin, Yosemite Valley and Grouse Creek basin; a total area of about 30,000 acres. The overwintering infestation on the entire control area amounts to approximately 800 infested trees. The peel-and-burn method of control was adopted for this project for two reasons; its reliability in this region has been demonstrated in past control projects in this park and on many other areas in westside Sierra forests, and also because the park personnel is thoroughly familiar with this method. To insure success of the project, the control work should be completed before the overwintered broods emerge in the spring of 1944.


LEGEND
PINE TIMBER STANDS
Infestation Normal
Light
Moderate
Heavy
Cut-over, as of
BOUNDARY LINES
Yosemite National Park
Entomological Areas
Insect Control Units
Pine Timber Type
GROUND SAMPLES
Plots
Strips
Observation Points
UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
DIVISION OF FOREST INSECT INVESTIGATIONS
FOREST INSECT SURVEY
YOSEMITE NATIONAL PARK, CALIFORNIA
SEASON OF 1943
SCALE MILES
0 2 4 6
YOSEMITE NATIONAL PARK
TUOLUMNE RIVER AREA
TUOLUMNE RIVER AREA
MERCED RIVER AREA
MERCED RIVER AREA
WAWONA AREA
Relief Reservoir
Emigrant Lake
Lily Lake
Twin Lakes
Tilden Lake
Mono Lake
Saddlebag Lake
Lake Eleanor
Hetch Hetchy Reservoir
Yosemite Lodge
Camp Curry
Carsons Camp
Garnet Lake
DEVIL POSTPILE NAT MON
Mather
El Portal
Kinsley
Coulterville
Bagby
Jerseydale
Wawona
Mt Bullion
MARIPOSA
Hornitos
Fish Camp
Usona
Sugar Pine
Nipinnawasee
Cathay
Ben Hur
Mist
Ahwahnee
Minarets
Lewis
Groveland
Tuolumne
Cherry
Clavey
Merced
Tenaya
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